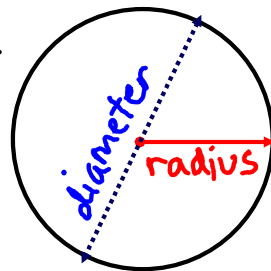


## Using midpoint and distance in circles

### Circles

A circle is a simple shape consisting of points in a plane which are equidistant from a given point called the center. The common distance of the points of a circle from its center is called its radius.



## Important Formulas

$$M = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\text{Area of a circle} = \pi r^2$$

$$\text{Circumference} = \pi d = 2\pi r$$

## Using the formulas with circles

A (-11, -5)

$x_1, y_1$

C (-29, -17)

$x_2, y_2$

Find the center, area, and circumference.

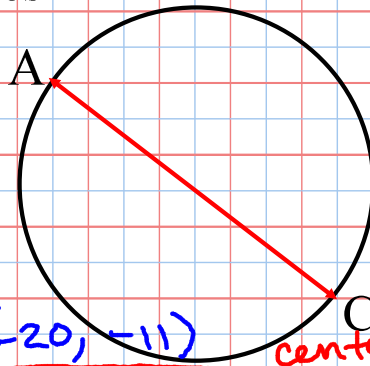
midpoint distance

$$M = \frac{-11 + -29}{2}, \frac{-5 + -17}{2} = (-20, -11) \text{ center}$$

$$D = \sqrt{(-20 - -11)^2 + (-11 - -5)^2} = \sqrt{(-9)^2 + (-6)^2}$$
$$= \sqrt{81 + 36} = \sqrt{117} = \text{radius}$$

$$A = \pi(\sqrt{117})^2 = 117\pi$$

$$C = 2\pi(\sqrt{117}) = 2\sqrt{117}\pi$$



## Using the formulas with circles

A (-3, 1)

C (5, -11)

Find the center, area, and circumference.

$$M = \text{center} = \frac{-3+5}{2}, \frac{1+(-11)}{2}$$

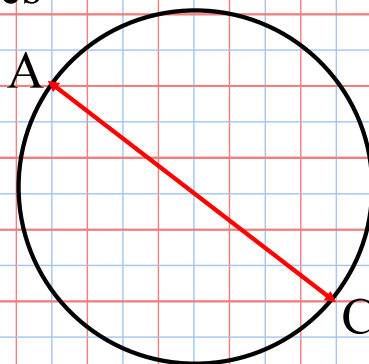
$$\text{center} = (1, -5)$$

$$D = \sqrt{(1 - (-3))^2 + (-5 - 1)^2} = \sqrt{16 + 36} = \sqrt{52}$$

$$A = \pi (2\sqrt{13})^2 = 52\pi$$

$$C = 2\pi (2\sqrt{13}) = 4\sqrt{13}\pi$$

$$\begin{aligned} \sqrt{52} &= \sqrt{4 \cdot 13} \\ &= 2\sqrt{13} = r \end{aligned}$$



## Using the formulas with circles

A (8, -8)

C (2, -13)

Find the center, area, and circumference.

$$M = \text{center} = (5, -10.5)$$

$$\begin{aligned} D &= \sqrt{(5-2)^2 + (-10.5 - (-13))^2} \\ &= \sqrt{9 + 6.25} = \sqrt{15.25} = \sqrt{\frac{61}{4}} = \frac{\sqrt{61}}{2} \end{aligned}$$

$$A = \pi \left(\frac{\sqrt{61}}{2}\right)^2 = 15.25\pi$$

$$C = 2\pi \left(\frac{\sqrt{61}}{2}\right) = \sqrt{61}\pi$$

